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ABSTRACT

This study investigated what is known about content area instruction for linguistically and culturally diverse learners (LCDLs) in mainstream social studies, mathematics, science, and language arts classes. A review of recent literature looked at three major areas: (1) the theory and practice of standards for this group; (2) theory and practice of measures of achievement, proficiency, and/or academic literacy; and (3) promising practices in content area instruction. The study also included interviews with university education faculty to determine current issues and effective practices within the various subject areas, and site visits to a suburban high school that had implemented a team approach to working with language minority students in mainstream classrooms. Some classroom observations are presented as vignettes. Contains 52 references. (MSE)

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National Clearinghouse for Bilingual Education, September 1997

Academic Achievement for Secondary Language Minority Students: Standards, Measures and Promising Practices

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Gorena, and Barbara Silcox of the National Clearinghouse for Bilingual Education at The George Washington University, Graduate School for Education and Human Development, Center for the Study of Language and Education.

Overview

This document was prepared under contract by the National Clearinghouse for Bilingual Education in response to task order number D0003 for the U.S. Department of Education, Office of Bilingual Education and Minority Languages Affairs. In accordance with the task order requirements, this document summarizes, analyzes, and integrates findings from relevant research pertaining to the education of language minority students in the content areas. Specifically, the document focuses on several key questions outlined in the task order:

(1) What does the relevant literature pertaining to content area instruction of linguistically and culturally diverse learners (LCDLs) contribute to the theory and practice of standards for LCDLs?

(2) What does the relevant literature pertaining to content area instruction of LCDLs contribute to the theory and practice of measures of achievement, proficiency, and/or academic literacy for LCDLs?

(3) What does the relevant literature pertaining to content area instruction of LCDLs contribute to the field of promising practices in content area instruction for LCDLs?

In order to respond to the task order requirements and examine a specific facet of content area instruction particularly pertinent in this era of educational change, this study focused on the instruction of secondary-level language minority students in mainstream social studies, science, mathematics and language arts classes. Research included an extensive search of the National Clearinghouse for Bilingual Education (NCBE) bibliographic database as well as the ERIC Bibliographic database and various World Wide Web sites, such as the Eisenhower National Clearinghouse for Math and Science, for literature on the effective instruction of language minority students within secondary mainstream settings. Literature pertaining to curriculum and instruction, content standards, assessment, and teacher training and education was identified and analyzed for inclusion in the document.

This study also involved a series of interviews during the months of January to April 1997 with education faculty at The George Washington University in Washington, DC to determine current issues and effective practices within the various content area domains. These faculty members are responsible for preparing preservice teachers for mainstream classroom instruction at the secondary level within core content areas. The professors interviewed and their fields of specialization are as follows: Dr. Kathleen Steeves, social studies; Dr. Sharon Lynch, science; and Dr. Linda Mauro, English language arts. The results of these interviews, which were tape recorded and transcribed, helped inform the discussion of each of the content areas. In addition, these individuals are quoted throughout the document.

Site visits to a suburban high school that had implemented a team teaching approach for working with language minority students enrolled in mainstream classrooms were also conducted in May 1997 in order to collect information in a "real-life" setting. Two team-teaching situations were observed. The first involved a Sophomore-level biology class in which an ESL teacher teamed with a mainstream biology teacher to provide an enriched environment for language and content instruction. In the second setting, a social studies teacher and an ESL teacher worked together, with the social studies teacher providing the content, and the ESL teacher focusing on making the content comprehensible to the language minority students. Both classrooms included native English speaking students and language minority students.

In addition to discussing instructional methodology and curriculum within the four core content areas, the study also examined national content standards documents written for these subject areas and related the ideas and recommendations contained therein to what is known about effective educational practice for language minority students. Specifically, the standards documents were analyzed to determine whether their theoretical bases were consistent with what educational research tells us is effective practice for language minority students. In addition, the documents were examined for commonalities between recommended instructional or curricular practice for mainstream students and recommended practice for language minority students. The following standards documents were included in this study: *National Standards for United States History: Exploring the American Experience, grades 5-12; Curriculum and Evaluation Standards for School Mathematics; National Science Education Standards;* and *Standards for the English Language Arts.*

The intent of this document is to provide teachers and teacher educators insight into how mainstream classroom instruction can be designed and implemented to enhance the academic achievement of language minority students. With this goal in mind the report was organized into four sections pertaining to the four main content areas. Within each of these sections, standards for the content area in question were examined and related to what research indicates is best practice for language minority students. Effective instructional and curricular models were described along with some of the background knowledge necessary for teachers to effectively implement these models. Throughout, vignettes of actual classroom experiences and comments by the various George Washington University professors add context and additional insight to the discussion. Sections on promising practices in the assessment of language minority students within the content areas and the preparation of mainstream teachers to work with these students were also included.

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Introduction

Vignette 1: Biology Class Observation

As the bell signals the beginning of the second block period, biology students take their seats at seven tables spaced evenly around the classroom. Interspersed among the students are ten who have relocated to this large suburban high school from such places as Ghana, Liberia, Bangladesh, Vietnam, Korea, Pakistan and El Salvador. These students mix well with the diversity of "mainstream" students comprising this Sophomore-level class. At first glance, it is difficult to determine which students are the English as a second language (ESL) students and which are not. Two teachers conduct this class of more than 30 students, a biology teacher and an ESL teacher. As the instruction proceeds it becomes clear that the biology teacher introduces the content, in this case a lab experiment on measuring lung capacity, while the ESL teacher assists by clarifying certain points, writing key expressions on the board, or by circulating and quietly checking with individual students.

To augment the introduction of the lab, which consists of blowing up a balloon and measuring its width in order to determine differing lung capacities, the instructor explains key terms related to lung capacity by exaggerating her breathing motions, followed by having the students perform the same motions with her. She simultaneously relates her motions to the terms she has written on the board. She speaks somewhat more slowly than usual and enunciates her words carefully. To explain the lab assignment, she designates various students to read each step. After each step, she has a student sitting toward the front of the room demonstrate the corresponding step. When an ESL student is called upon to read, the ESL teacher assists by helping her with certain words she has difficulty pronouncing. At one point, the biology teacher demonstrates the amount of residual volume in the lungs by holding up a glass beaker so that students can visualize the approximate amounts for men and women. Part of the lab involves using mathematical formulas. These have been written on the board. The ESL teacher adds the formula for determining averages and gives an example to clarify.

After explanation of the lab, students work with partners at their tables. For the most part, ESL students are paired with native speakers. The room is noisy with the sounds of blowing up balloons and chatter back and forth among the students. Both teachers circulate throughout the room answering questions and checking student work. At one point the ESL teacher who is working intensively with two students near the front of the room pulls one student to the board to help him with the mathematical formula. She first questions him to find out what he knows, then elaborates to supply the needed information. Finally, she has him show her that he understands by applying his own measurements to the formula. At another point a native speaker, who has been doing the ESL student's work for her, is told in what ways she can help her partner-- by explaining what she doesn't understand-- but that she shouldn't do the calculations for her. Both teachers are active and involved with all students. The focus is on understanding the lab and completing it within the class period. Most students, including all the ESL students, complete the lab within the hour and a half time period. Some will meet later with the ESL teacher to complete questions relating to the lab. A block of time has been set aside toward the end of the day for such individualized instruction.

A Common Phenomenon...

The above scenario depicts what is becoming a common phenomenon in U.S. schools, the presence of

significant numbers of language minority students in mainstream settings. During the past two decades, increases in the number of language minority students have had a major impact on our nation's classrooms. The degree to which mainstream classroom instruction meets these students' needs, however, varies dramatically from school to school and classroom to classroom. For the 1994-95 school year a total of 3,184,696 limited English proficient (LEP) students were enrolled in U.S. schools. This figure represents 6.7% of the total K-12 student population. In addition, this figure, while significant, most likely under represents the actual number of language minority students in need of services (Macías and Kelly, 1996).

Language minority students encounter a variety of difficulties in achieving academic success in U.S. schools. These difficulties may be related to language, educational background, socioeconomic status, psychological trauma, or any combination of these factors. Research indicates that the process of learning academic language requires much more time than that needed to learn language for interacting on a social level with English speakers. Ability with social language is usually developed within the first two years of arrival in an English-speaking setting; however, the language needed for learning academic content may require five to eight years, or longer, depending on the age and prior educational background of the student (Collier, 1995). This situation is exacerbated at the secondary level due to the higher cognitive demands of the curriculum and the fact that many secondary-age language-minority students may have significant gaps in their prior education (McKeon, 1994).

Who is Responsible?

> Because language minority students spend most of their time in mainstream classrooms, mainstream teachers must accept responsibility for educating these students.

Responsibility for instructing language minority students is increasingly falling on the shoulders of mainstream teachers. Reasons for this increased responsibility include the inadequacy of pull-out programs, still the most prevalent form of ESL instruction, which, at best, allow for one to two hours of instruction per day (Cornell, 1995). The downfall of pull-out programs is the tendency to assume that the short period of pull-out instruction is the learning for the day, while the time spent in mainstream classes is merely a waiting period until proficiency is acquired through the language program (Handscombe, 1989). Such an assumption is especially detrimental at the secondary level where students have "a window of a few years" to acquire the language ability necessary for successful academic course work (Whitten, 1995). Furthermore, pull-out time is often devoted to completing mainstream homework, which, though important, often forces the pull-out teacher to neglect language instruction. Self-contained ESL or bilingual classrooms, though capable of providing a richer environment for language and content learning, are considered unfeasible alternatives with many administrators due to the increased expenditures necessary to maintain them. For these and other reasons, language minority students spend most of their time in mainstream classrooms; thus, whether these students are given the opportunity to achieve academically depends to a great extent on the quality of mainstream instruction (Cornell, 1995).

Standards and the Language Minority Student

> A means to ensuring that language minority students have equal access to challenging academic content is the use of effective educational practices for these students in mainstream classrooms.

The last two decades have also witnessed the movement to establish rigorous academic standards in the various content areas. At the national level, most academic fields, such as English language arts, history, science, and mathematics, have issued content or curriculum standards for their respective areas. These core standards exist to guide state and local initiatives in setting standards and have influenced activity at these levels to a significant degree (Chris Green and Solis, 1997). Meeting these content standards will be disproportionately difficult for language-minority students since they will have to perform at much higher cognitive and linguistic levels than their native-speaking peers. In mainstream settings, native speakers, for whom English is nearly automatic, can focus primarily on the cognitive tasks of an academic assignment--learning new information, procedures, etc.-- however, the student with limited ability in English must focus on both cognitive and linguistic tasks--learning new vocabulary, structures and academic discourse (McKeon, 1994). Thus, setting rigorous academic standards does not necessarily ensure that *all* students will have the opportunity to achieve them. An important issue concerns whether or not standards will be able to help educators meet the needs of language minority students without punishing them for previous educational neglect or for their linguistic and cultural diversity (Chris Green and Solis, 1997).

A means to ensuring that language minority students have equal access to challenging academic content is the use of effective educational practices for these students in mainstream classrooms. Many of the standards documents recommend instructional practices that will lead to achieving the standards. Thus, these documents have far-reaching implications for mainstream instructional practice-- and, consequently, for the education of language minority students. In order to understand issues relating to effective practice and curriculum within the major content areas of social studies science, mathematics, and language arts, issues that will influence the instruction of language minority students within mainstream classrooms, the standards and recommended practices proposed for these areas must be examined in light of what is known about effective practice for language minority students.

Mainstream Teacher Preparation: Critical, Yet Often Neglected

> What do mainstream secondary teachers, as well as teacher educators, need to consider in order to plan and implement effective educational programs for language minority students?

The quality of mainstream instruction depends not only on the existence of effective instructional methodologies but also on whether teachers are well prepared to work with language minority students. Given that these students spend a much greater proportion of their time in mainstream classrooms, it is not enough to educate only ESL and bilingual teachers to work with these students; mainstream teachers must also be prepared to meet the unique needs of this group. However, despite the fact that at least fifty percent of American teachers teach a language minority student at some point in their careers, many mainstream content area teachers receive little or no preparation in working with these students (McKeon, 1994). Underpreparation often leads to resentment and a willingness to pass off these students to the bilingual or ESL program. Secondary-level teachers are even more likely to react in such a way since they often

perceive of themselves primarily as content specialists and not as language teachers (Constantino, 1994). Thus the need for preservice teacher education that includes issues related to the education of language minority students is critical to the implementing of effective mainstream programs for these students.

What do mainstream secondary teachers, as well as teacher educators, need to consider in order to plan and implement effective educational programs for language minority students? Areas important to consider include characteristics of secondary language minority learners and their relationship to the content being taught, standards and their implications for these students, classroom environments that encourage academic success, and teacher behaviors and instructional approaches that help make language and content accessible to language minority students. The following sections discuss these issues within the context of the content areas of social studies, science, mathematics, and English language arts. Concluding sections examine effective assessment practices for language minority students and the type of educational programming necessary to prepare mainstream teachers to work with students of culturally and linguistically diverse backgrounds.

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Content Area Learning, Standards, and Instructional Approaches

Social Studies

Social studies content at the middle and secondary levels encompasses a range of knowledge bases including world and U.S. history, geography, political science, civics and economics. Curriculum and instruction in social studies are increasingly guided by standards at the national, state, and local levels. National standards have either been developed or are currently under development for U.S. and world history, civics, geography, economics, and social studies. National U.S. history standards bring together a number of these areas of knowledge under the umbrella of historical understanding and refer to them as spheres of human activity. These spheres include the social, political, scientific/technological, economic, and the cultural. Each of these spheres is then addressed within ten eras encompassing the whole of American history from its pre-European beginnings to contemporary times (National Center for History in the Schools, 1994).

U.S. History Standards and the Language Minority Student

> Content standards should reflect the best available knowledge about how LEP students learn and about how the content can best be taught to them (August, Hakuta, and Pompa, 1994).

The authors of the U.S. history standards emphasize that the study of history involves much more than the passive absorption of facts, dates, names and places. Students must be able to engage in historical thinking. Historical thinking demands that students "think through cause-and-effect relationships, reach sound historical interpretations, and conduct historical inquiries and research leading to the knowledge on which informed decisions in contemporary life can be based. These thinking skills are the process of *active* learning" (National Center for History in the Schools, 1994). The standards outline five historical thinking areas in which students should develop competence. These include:

- chronological thinking, which involves developing a clear sense of historical time;
- historical comprehension, including the ability to read historical narratives, identify basic elements

of the narrative structure, and to describe the past through the perspectives of those who were there;
- historical analysis and interpretation;
- historical research, which involves formulating historical questions, determining historical time and context, judging credibility and authority of sources, and constructing historical narratives or arguments; and
- historical issues-analysis and decision-making, including the ability to identify problems, analyze points of view, and decide whether actions and decisions were good or bad.

Though no specific guidelines for providing equal opportunities for language minority students to learn such challenging content and abilities are given in this standards document, the authors declare that these standards should be expected of all students and that all students should be provided equal access to the educational opportunities necessary to achieve them (National Center for History in the Schools, 1994).

Standards Should Incorporate Best Practices for Language Minority Students

In outlining their recommendations to ensure that LEP children are considered and included in standards development, the Stanford Working Group on Federal Education Programs for LEP Students states that content standards should reflect the best available knowledge about how LEP students learn and about how the content can best be taught to them (August, Hakuta, and Pompa, 1994). In the *National Standards for U.S. History, Grades 5-12*, Standard 1A within the era "Three Worlds Meet" asks that students "demonstrate understanding of commonalities, diversity, and change in the societies of the Americas from their beginnings to 1620 by...(one among four objectives) comparing commonalities and differences between Native American and European outlooks, and values on the eve of 'the great convergence'" (National Center for History in the Schools, 1994). Such a standard, while outlining what a student should know and be able to do in history, fails to offer guidance on how teachers of language minority students can help these students learn this material.

A better example of how standards can reflect what is known about exemplary instruction for language minority students comes from *Standards for the English Language Arts*. For example, standard number three requires that "students apply a wide range of strategies to comprehend, interpret, evaluate, and appreciate texts...." The authors then elaborate on this standard, as they do with others, in the following manner: "Although students come to recognize many of these expectations and strategies as they read and discuss related groups of texts, teacher explanation and modeling of reading strategies and independent conscious study also contribute to students' proficiency. Students need encouragement to think and talk about how they are creating meaning as they read and to pay close attention to the strategies they are using to do so. Students should explore this meaning-making process explicitly, talking about how they move from predicting to confirming (or revising) their predictions, and back again" (International Reading Association and National Council of Teachers of English, 1996). In this expository fashion, the authors of the English language arts standards uphold and reinforce what educators of language minority students know about the development of reading strategies.

Standards Should Emphasize Diversity

> Using a multicultural social studies curriculum as a base, social studies teachers can emphasize and build on the cultural and world knowledge language minority students bring to class.

The Stanford Working Group also specifies that social studies content standards should reflect the

diversity of this country (August, Hakuta, and Pompa, 1994). The *National Standards for U.S. History* meet this second recommendation concerning multicultural content. In reflecting upon the impact of these standards, Dr. Kathleen Steeves, a social studies education professor at The George Washington University, makes the point that the inclusion of multicultural content, what to include and what not to include, was perhaps the most troublesome issue for standards developers at both the national and local levels. "Do we look at history and talk about all of the warts? Do we include women and minorities? Do we make them part of the history or side bars?" These types of questions, and how they are answered, help define how students conceptualize diversity, a central concern of social studies education. "The general feeling is that we need to do a better job of inclusion-- it's how you do it that's at issue."

Social Studies Curriculum: What Works for Language Minority Students

A multicultural history curriculum is an excellent content base for second language learners. According to Dr. Steeves, with such a curriculum, social studies teachers can emphasize and build on the cultural and world knowledge language minority students bring to class. For example, a unit on westward movement in the U.S. developed within the context of larger patterns of migration and immigration can lead language minority students to explore how they fit into these patterns of movement as newcomers to the U.S. (King, et.al., 1992). Thus, in conjunction with the students' own backgrounds and experiences, documents with a multicultural focus, such as the *National Standards for U.S. History* can serve as useful resources for curriculum development.

Use the Thematic Approach

> Thematically organized curricula have been found to work well with language minority students.

One method for organizing the curriculum to better meet the needs of language minority students is the thematic approach. A recent study noted that thematic units served as the predominant mode of organizing curriculum in schools where language minority students were particularly successful (Farr and Trumbull, 1997). Though useful in integrating material within one academic discipline, the thematic approach is particularly powerful in integrating instruction across disciplines. Lessons can be designed to help students make connections and achieve a deeper understanding of a concept by studying it from several disciplinary views. Themes derived from social studies can serve to unify several academic disciplines. In *School Reform and Student Diversity: Case Studies of Exemplary Practices for LEP Students*, the authors describe Hanshaw Middle School's use of thematic instruction to unify instruction across subject areas. A particular theme drawn from social studies was "I Have a Dream" from the Martin Luther King speech. The theme brought together social studies and language arts by focusing on the dreams held by people and the ways in which they realized their dreams. Students interviewed an immigrant using questions developed by the class, wrote essays about the immigrants' experiences, and investigated the immigrants' dreams concerning the U.S. (Berman, et.al., 1995).

Allow for In-depth Thinking

> Effective social studies curricula emphasize depth of coverage over breadth.

Curriculum designers in social studies, or other content areas, should note the following cautions. First of all, curriculum writers should not assume that comprehensive coverage of a subject must be the goal.

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Oftentimes comprehensive coverage results in superficial coverage of topics without giving students the opportunity to fully comprehend important concepts. Such an approach makes learning particularly difficult for language minority students who, as previously mentioned, must attend to both cognitive and linguistic tasks simultaneously. Curriculum planning must allow for more in-depth thinking about fewer topics. Additionally, curriculum developers should avoid trivializing instruction by merely adding insignificant details, such as foods and festivals, in order to "multiculturalize" the curriculum. A multicultural social studies curriculum does not simply add surface cultural details; rather, it involves students in thinking deeply about the meaning of cultural and linguistic differences (Farr and Trumbull, 1997).

Key Issues in Developing Social Studies Curricula for Language Minority Students

Certain issues pertaining to language minority students have important implications for social studies curriculum development. Curriculum in social studies, as in many other subject areas, depends on continuity, with content in any one course building upon content supposedly mastered in previous courses (Harklau, 1994). However, most secondary language minority students have not had eight or nine years of previous instruction in U.S. elementary and middle schools; thus their prior knowledge will be different than that of their native-English speaking peers who have benefitted from such instruction. Furthermore, social studies materials are often too difficult for these students whose academic language abilities often lag well behind their grade-level peers. Unfamiliar vocabulary and linguistic constructions impede their ability to grasp new concepts (King, et.al., 1992).

Link Social Studies Concepts to Students' Prior Knowledge

As learning theorists and researchers have known for years, a learning situation can be meaningful only if the learner can relate the new learning task to prior knowledge. For the social studies teacher, this idea is critical. One of the more promising approaches to dealing with the issue of gaps in prior knowledge makes few assumptions about students' prior social studies learning. The curriculum should begin with the most basic concepts and gradually develop related ideas into broader units of study. In social studies, many of the primary historical events and developments can be related to basic concepts applicable to a variety of situations and settings. For example, prior to beginning study of the American Civil War, class discussion can center around the notion that differences may lead to conflict, a concept with which students are familiar from their own personal experiences and problems with being different. Extending this understanding into social, political, and economic differences among groups of people is a logical next step followed by focusing on differences between North and South prior to the Civil War. Finally the Civil War itself can be introduced within a context made rich by both personal experience and broad-based content knowledge. Thus, teachers can utilize students' experiential knowledge by relating it to an important social studies concept and the events leading to the Civil War (King, et.al, 1992).

Strive for Flexibility

> Flexibility is a key factor in successful curriculum development for and instruction of language minority students

In her analysis of the ways in which mainstream classrooms and ESL classrooms differ, Harklau (1994) makes several observations which have implications for mainstream course curriculum and planning. Most importantly, she found that flexibility was a key factor in successful instruction of language minority students. The constantly shifting needs of the language minority population called for more flexible

guidelines and much more autonomy in setting course curriculum. The ESL teachers Harklau studied responded by developing a spiral syllabus and unit-based approach to curriculum that could be easily adjusted up or down or supplemented, depending on the needs of the class (Harklau, 1994). Mainstream teachers working with language minority students may need to adopt a similar approach to curriculum, rather than the usual rigid grade-level guidelines.

Oral History Offers Language Minority Student Access to the Curriculum

An interesting and flexible approach to social studies curriculum and instruction involves using oral history as a medium to make history more accessible to language minority students. Oral history helps students understand that history is composed of stories in which they and their families have participated. Such an approach can support the learning of new concepts while making them more comprehensible. Concepts including religious persecution, tyranny of autocratic rulers and the rights and responsibilities of self governance are more accessible when developed from students' backgrounds and experiences. These backgrounds and experiences form the raw historical data from which a social studies curriculum can be built (Olmedo, 1993). In working with data obtained from interviews, students will be engaging in many of the historical thinking skills outlined in the U.S. history standards, skills such as chronological thinking, reading historical narratives, describing the past through the perspectives of those who were there, and historical analysis and interpretation.

In addition, oral history serves as an avenue through which students can strengthen their language skills. Oral language skills are involved when interviewing and presenting information to classmates. Literacy skills are developed through translating and transcribing oral interviews into English. Important offshoots of using oral history include the involvement of parents and families in the student's education, the use of the native language in meeting instructional goals, the validation of the student's culture and experience, and the enhancement of self esteem-- all critical factors in the academic achievement of language minority students (Olmedo, 1993).

Steps in Implementing an Oral History Approach

(1) Identify which social studies concepts to teach. Olmedo (1993) lists some common concepts taken from the National Council for the Social Studies Task Force on Scope and Sequence (1989) including dependence and interdependence, interaction of human beings and their environment, resource development and use, scarcity, migration, acculturation, the impact of economic or technological changes on societies, issues of war causes and results, the meaning of culture rights and concepts such as the effect of climate and natural resources on economic structures and the way of life of the people.

(2) Develop questions or an interview guide jointly with students that can be used to interview family members, neighbors, or someone in the ethnic community.

(3) Translate or assist students in translating the questions into the students' native languages.

(4) Provide training and practice in using tape recorders and in conducting interviews.

(5) Invite a guest speaker from the community to be interviewed by the class as a practice activity.

(6) Have students select an interviewee.

(7) Assign students or small groups the tasks of interviewing, transcribing or summarizing the tape, and sharing knowledge gained with the class.

(8) Create a list of themes from the students' interviews and use them along with portions of the text or other classroom materials to reinforce social studies concepts.

(9) Finally, have students compare and contrast the experiences of their interviewees with information learned from reading historical biographies, excerpts from texts, and other source materials (Olmedo, 1993).

Social Studies Instruction: What Works for the Language Minority Student

According to Dr. Steeves, certain process-oriented approaches emphasized in social studies teaching are effective strategies for working with language minority students in mainstream settings. In addition to the previously mentioned thematic approach, these approaches include concept attainment and formation, cooperative learning, and inquiry learning. Concept attainment and formation is important in a field such as history which has a number of concepts, such as democracy and culture, that students must comprehend in order to make sense of the subject matter. In presenting new concepts, one approach is to give students characteristics that they can piece together to form the concept; conversely, the teacher can elicit pieces of the concept students already have and guide them toward a definition. The approach used depends on what the students already know about a particular topic; thus, an understanding of the students' prior knowledge is critical, particularly in the case of language minority students whose background knowledge in social studies may differ from that of other students. If the concept is one with which the students have some familiarity, instruction often begins by eliciting what students already know. If the concept is foreign, then the teacher can begin by sharing some of the defining characteristics and have students then determine what those characteristics mean and how they understand them.

Use Cooperative Learning

> Language minority students need frequent opportunities to interact with their native English speaking peers in academic situations.

In a recent study concerning attributes of effective instruction for English language learners, the authors highlight the importance of providing opportunities for and encouraging interaction between English language learners and native English speakers (August and Pease-Alvarez, 1996). Cooperative learning offers language minority students the opportunity to interact with their native-speaking peers in such a manner and to communicate their thoughts and ideas in a supportive and non-threatening environment. When students work cooperatively to complete a task, language minority students receive instruction from their peers that is individually tailored to their language ability and academic needs. Working in structured groups increases the variety of ways information can be presented and related to what is already known. Furthermore, active listening and speaking in cooperative settings, provides a rich language environment for both comprehensible input and practice in speaking that students cannot get in a more traditional classroom environment (Olsen, 1992). Care must be taken, though, to prevent cooperative learning projects from degenerating into group work where the best students do all the work. Language minority students do not benefit in this situation (McPartland and Braddock II, 1993).

An example of a social studies cooperative learning activity structured so that all students must participate involves creating a situation where different points of view are developed. By providing each group member with conflicting information, "creative controversy" develops.

Social Studies Cooperative Learning Activity: Creative Controversy

Students are given two maps and two readings that give different answers to the question "Who discovered America?" Depending on ability levels (language and knowledge), students might master their parts individually, in pairs, or in temporary expert groups-- meetings of students from all the "home" teams who have the same map or reading. If expert teams are homogeneous for language, the native language can be used; if heterogeneous, more proficient English speakers can explain and clarify for the less fluent. Upon returning to home teams, each student must argue for his/her explanation of who discovered America. The cooperative learning structure "Roundtable" can be used to ensure that all team members offer their information. In Roundtable, there is one piece of paper and one pen for each group. Each student makes a contribution in writing then passes the paper and pen to the next student. This activity can also be done orally (Olsen, 1992).

Within a social studies classroom, communication in small groups can assume many forms, one of which is role playing, a widely used strategy for fostering the development of communication skills with language minority students. As Dr. Steeves points out students might be asked to assume certain historical perspectives and to problem solve from those perspectives. For example, groups could function as American Indian tribal councils in order to examine a political issue facing that council during a particular historical period. Such problem solving and role playing provide opportunities for students to practice other communication skills, such as reporting out a group decision or presenting findings to the class.

Make Social Studies Content Accessible

> Using historical artifacts is particularly effective with students from other countries and cultures who may be able to share items that provide a different perspective on history.

Other important strategies for social studies teachers working with language minority students include the use of visuals and realia that transcend language barriers. Media materials for social studies are available in most school libraries. Prints and picture sets relating to specific themes are useful for conveying information and inducing thinking (King, et.al., 1992). Dr. Steeves advocates for the use of historical artifacts to initiate the inquiry process. The teacher may begin the lesson by handing an artifact, such as a tool, to students and having them guess what they think it might be, or what material it is made of, or how and when it was used, etc. Such an approach is particularly effective when students work in small groups where language minority students can feel less inhibited to venture guesses and share expertise. With this format, the teacher can also assess prior knowledge and encourage question asking, integral to the inquiry process.

Artifacts such as costumes, tools, photographs, record books, wills, written documents and other objects encourage students to begin thinking about their own family history and consider artifacts their own families may possess that can be brought in. This approach allows students to view history from a more personal perspective and as a subject relevant to their own lives. Students can begin to build concepts of what a particular era means by working with artifacts representative of that time. Classification of such artifacts motivates students to use higher order thinking skills to make sense of "data" and to generalize about a particular historical period.

The use of artifacts is particularly effective with students from other countries and cultures who may be able to share items that provide a different perspective on history or open up new avenues of discussion. Language minority students will benefit by having their contributions acknowledged and respected as integral parts of the curriculum.

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Science

According to Dr. Sharon Lynch, science education professor at The George Washington University, science at the secondary level has traditionally been taught for the twenty percent of students who were college bound through textbook, test-driven methods. In contrast, effective science teaching encourages all students to become scientifically literate and to develop scientific habits of mind. The *National Science Education Standards* define scientific literacy in the following manner:

Scientific literacy means that a person can ask, find, or determine answers to questions derived from curiosity about everyday experiences. It means that a person has the ability to describe, explain, and predict natural phenomena. Scientific literacy entails being able to read with understanding articles about science in the popular press and to engage in social conversations about the validity of the conclusions. Scientific literacy implies that a person can identify scientific issues underlying national and local decisions and express positions that are scientifically and technologically informed. A literate citizen should be able to evaluate the quality of scientific information on the basis of its source and the methods

used to generate it.... (National Research Council, 1996).

National Science Education Standards and the Language Minority Student

> National science education standards provide insight into more effective science learning for language minority students.

Such a goal requires a radical departure from traditional science teaching methods that emphasized the acquisition of specific facts and procedures and the idea that scientists work according to a narrowly conceived, logical method known as the scientific method. Rather, the national science standards advocate for the teaching of scientific inquiry as both "the diverse ways in which scientists study the natural world and propose explanations based on the evidence derived from their work" and the methods students use to develop an understanding of scientific ideas. Inquiry involves students in observing; asking questions and proposing solutions, explaining and predicting; planning experiments; referring to written and other source material to determine what is already known, using various implements to conduct investigations; and communicating outcomes. Authors of these standards view inquiry as the primary means of comprehending scientific concepts (National Research Council, 1996).

Involve Students in Scientific Inquiry

This restructuring of science education offers the potential for more effective science learning for language minority students and conforms with what is known about effective education for language minority students. Scientific inquiry involves language minority students in hands-on activities that provide opportunities for purposeful language use in meaningful academic experiences. For example, most scientific investigation requires data collection and reporting, which can be accomplished in various ways. Student work can include vocabulary charts, diagrams, graphs, timetables, schedules and pictures as well as the more traditional venues of written lab reports and science fair exhibits. These options help ensure that all students will have access to the content material in a variety of modes from highly contextualized cognitively undemanding experiences to more abstract, less contextualized tasks (Rupp, 1992).

> Effective science education for language minority students provides a variety of venues through which a student can learn a particular science concept.

However, as with any instructional adaptation, care needs to be taken that content is not "watered down." Dr. Lynch emphasizes that using a "menu approach" with students selecting different projects does not guarantee that the same concept will be learned. She describes a lesson in which students were allowed to select various projects, some of which were things they could build with their hands; others required drawing a diagram; and still others entailed writing an editorial. High verbal functioning students chose to write an editorial concerning scientists raiding an Egyptian tomb. Others made clay models of an Egyptian tomb. She doubts whether those making model tombs were learning the same concepts as those writing the editorial. She provides a more appropriate use of the menu approach in science in which the objective is to understand the basic properties of a cell-- that it's a unit of life, has different parts, and divides to make more. Here, one student could construct a diagram or model of the cell; someone else could investigate cloning. In this instance the same concept is developed through cognitively and linguistically varied activities.

Advocate For a "Less is More" Curriculum

Another area emphasized in the national science standards involves students in conducting investigations over longer periods of time in conjunction with studying fewer fundamental science concepts. This notion of spending more time on learning fewer concepts is also one of the key points of the Third International Mathematics and Science Study (TIMSS). In comparing science and mathematics education in the U.S. with that in other peer countries, investigators criticized the lack of a cohesive vision for mathematics and science education in this country. They blamed what they termed "splintered visions" for emphasizing "familiarity with many topics rather than concentrated attention to a few..." which, the authors claim, most likely "lowers the academic performance of students who spend years in such a learning environment. Our curricula, textbooks, and teaching are all 'a mile wide and an inch deep.'" Authors of the study note that curricula in this country lack the strategic concept of focusing on a few key goals, linking content together, and setting higher demands on students. A result of this splintered approach to teaching and learning is that students may grasp pieces but not the whole (Schmidt, et.al., 1996).

> Science curriculum development involves the careful organization of concepts to form connections and patterns across the discipline.

Educators of language minority students also advocate for a "less is more" curriculum for their students. Such a "selective curriculum" should include major principles and unanswered questions rather than an accumulation of random bits of knowledge (Chamot, 1993). To develop this selective curriculum, Dr. Lynch suggests the use of a unit organizer, a conceptual map, which lays out a picture of the big ideas in a unit and how they're connected to one another. She cautions, "What can happen in science is, for example, if a teacher is doing a unit on sound, he may look through the text book and choose a series of experiments and other activities, and then perhaps he brings in his guitar and from all of this creates a set of experiences. I call this the 'beads on a string' technique of teaching-- all the activities are sort of related to sound. If a student is from a typical middle class background, you can give them a string of experiences, and they'll come out the other end learning something. However, kids that come from other cultures need to have more explicit instruction. Consequently, a unit organizer can be helpful for teachers to understand how you structure activities and tie them together, making connections and patterns."

Teach the Language of Science

National science standards also emphasize the ability to reason and to communicate scientific ideas and information (National Research Council, 1996). An important aspect of science instruction concerned with achieving such standards is the use of activities where students are actively engaged in discussion concerning the outcomes of predictions made and the meaning of data collected. Attempting to carry on a scientific discussion assists in developing the ability to ask questions, propose tentative answers, make predictions, and evaluate evidence. However, the acquisition of certain linguistic structures of argumentation is thought to be a prerequisite for the kind of advanced reasoning used in scientific communication. If language minority students do not have access to these linguistic skills, they will not be able to engage in the level of discussion essential to scientific inquiry, and will have difficulty with science reasoning. Certain linguistic structures, such as logical connectors, and specialized vocabulary, both science terminology and vocabulary that may have different meanings in a scientific context are problematic for language minority students. Moreover, discourse patterns common to science such as compare/contrast, cause/effect, and problem/solution require a high level of linguistic functioning. Thus, cognitive development in science is heavily dependent upon linguistic development (Kessler, et.al., 1992).

> Teaching the language of science and modifying speech and textual materials are ways in which mainstream teachers can provide greater access to science content for language minority students.

Mainstream science teachers must be aware of what students need to know linguistically in order to understand and express themselves in science activities and must be able to incorporate opportunities to learn the English language into their lessons. Examples of activities that may be used to supplement science lessons as a support for vocabulary learning include having students draw and label diagrams or pictures related to science concepts; classify words into specific categories; fill in charts; order sentences in correct sequences; and use key vocabulary to answer how/why/what questions, summarize information from readings or observations, draw conclusions, or state opinions (Kessler, et.al., 1992).

Teachers will also need to assist students in acquiring linguistic structures and discourse patterns used frequently in science. By identifying one or two such structures or patterns associated with a particular topic or activity and incorporating appropriate language learning activities, science teachers can encourage the linguistic development essential for language minority students' cognitive development. Kessler, et.al. (1992) provide a sample unit on electricity which focuses on the discourse function of agreeing and disagreeing. The teacher or other students can model frequently-used expressions for agreeing and disagreeing, as well as associated linguistic structures for language minority students. Oral language activities could involve sharing information about observations and agreeing or disagreeing with others about why balloons attract or repel one another. Written activities might involve recording results and agreeing or disagreeing with written statements given by the teacher or other students.

Provide Comprehensible Input in Science Classrooms

In addition to actively teaching language, science teachers can make their language more comprehensible to language minority students by modifying their speech. New terminology should be limited to a manageable number. These words should be accompanied by visual or real referents whenever possible and reintroduced in different contexts. Students can also be guided in using these words during scientific investigations. Since scientific language frequently contains complex sentences in the passive voice, these structures should be shortened and expressed in the active voice. For example the passive statement, "Nutrients are needed by living things," can be expressed as, "Living things need nutrients."

> Mainstream teachers can provide comprehensible input for their language minority students by modifying their speech and adapting written materials.

Important concepts should be presented in a number of ways and in a variety of situations. Repetition and paraphrase can be used to reinforce concepts and provide a rich environment for language acquisition. Teachers should also consciously intersperse more questions within their discourse, to help students understand, to encourage critical thinking, and to find out what students know. Questions should be varied for both linguistic and cognitive complexity. Teacher questioning in the science classroom improves interaction, acts as a model for student questioning and supports the development of inquiry skills. Finally, teachers should give oral feedback on language through restatement, not overt correction. Errors are natural when acquiring a second language and should be dealt with by modeling correct forms through

restatement. For example, in response to the teacher's question, "What are some foods that contain protein?" a language minority student might answer, "Some food are eggs, milks, meats." The teacher can model correct language indirectly in the following manner: "Yes, some foods that contain protein are eggs, milk, and meat" (Fathman, et.al., 1992).

Adapt Written Materials for Language Minority Students

Making science information accessible to language minority students may also necessitate modifying written materials. Short (1992) provides suggestions for bringing written materials, whether in science or other content areas, within reach of language minority students for whom the vocabulary, linguistic structures and discourse patterns of many texts may be too difficult. She cautions that materials adaptation is more than simplifying vocabulary and shortening sentences, rather it implies adapting information to make it accessible to second language learners. Key to this adaptation is the presentation of visual information. Charts, graphs, and pictures make materials more accessible to students. For example, a flowchart with diagrams and pictures can convey a scientific process to students more rapidly than several paragraphs of text filled with complex structures and difficult vocabulary. Outlines can also serve to impart essential information more comprehensibly. Whereas timelines develop the higher-order thinking skill of sequencing, charts encourage comparison and contrast. Both formats emphasize essential points and reduce extraneous information.

Short (1992) recommends that teachers consider the students' proficiency level when reviewing possible formats for the material and question whether the material lends itself to an outline, chart, or simplified prose version. Students' prior knowledge about a topic should be considered when adapting materials. Background information may need to be added in order for the material to make sense. Limiting the amount of text and number of new vocabulary words, using simple verb tenses, and eliminating clauses helps make text more comprehensible as does simplifying grammatical structures. Teachers should also write in the active voice and reduce the number of pronouns. When used, paragraphs should be structured carefully. Placing topic sentences first followed by supporting information helps students organize new information. Markers, such as *first* and *next* to indicate sequence and *but* to indicate contrast should be retained and taught to students as guides in managing the flow of information.

Teach Problem Solving and Learning Strategies

> Successful teachers are those who help language minority students acquire strategies that facilitate both second language acquisition and knowledge acquisition (August, and Pease-Alvarez, 1996).

Along with emphasizing conceptual and language development, educators of language minority students need to teach problem solving strategies. These strategies are actions or certain thought processes that students apply to help them accomplish challenging tasks. Authors of the study on attributes of effective instruction for language minority students emphasize that successful teachers are those who help students acquire strategies that facilitate both second language acquisition and knowledge acquisition (August, and Pease-Alvarez, 1996). Recent research has shown that these strategies can be taught and learned. Effective teaching of problem solving strategies involves explicitly showing students that various strategies exist and how to use them appropriately. Though knowledge of a variety of strategies is integral to effective strategy use, students also need to know how to regulate their strategy use. Such regulation, a metacognitive skill, requires explicit teaching about such contextual factors as when, where and how to use particular strategies. Different tasks require different strategies; thus, students need to learn to recognize when certain

strategies will work and when they won't. Furthermore, teachers need to provide varied opportunities for students to practice using their strategies in pursuing academic learning (Padron and Waxman, 1993).

Spanos (1993) recommends the use of an integrated plan for learning which requires that teacher and students meet in a review session, in order to involve students effectively in the use of learning strategies. The following vignette provides an example of teacher follow-up after students had completed a series of science experiments in which they practiced specific learning strategies.

Vignette 2: Learning Strategies in Science

The instructor returned all of the student worksheets (he had been keeping the students' work in individual student portfolios) and asked them to complete checklists and evaluation forms that covered the four experiments. When they were finished, he conducted individual interviews with each student asking them to refer to their portfolios to clarify the checklists and evaluation forms. The interviews focused upon student perceptions of their learning both in terms of what they had learned and what they had learned how to do. The instructor was able to introduce learning strategy terminology...by simply asking questions such as: "What resources did you use?" "What can you infer from this experiment?" and "What words or information did you have to pay attention to to do the experiment?" This provided a vehicle for the instructor to integrate learning strategy instruction with content and language learning rather than isolating the learning strategy instruction and making it an end in itself (Spanos, 1993).

Integrate Language and Content Learning with Learning Strategy Instruction

The Cognitive Academic Language Learning Approach (CALLA) is an instructional model that combines English language and academic development with learning strategy instruction. The CALLA model has been successfully used with science, as well as with other academic subjects. A strategy important in scientific learning is the ability to make use of one's own background knowledge (Chamot, 1994). Most students come to science classes with naive, informal theories of heat, energy, motion, etc. that are either inconsistent or incompatible with current scientific knowledge of these areas. However, despite the knowledge area, learners will attempt to interpret new information in light of what they already know. If lessons designed to teach new concepts do not account for existing knowledge, no matter how naive or incompatible, it is highly likely that students will ignore or misinterpret such lessons. This tendency is even more likely to occur when lessons are given in a language students are still learning (Gelman, 1995). Ability to employ prior knowledge as a tool in acquiring new knowledge is a skill teachers need to develop with their second language learners. Chamot (1994) recommends various brainstorming and discussion activities prior to introducing new scientific concepts. Dr. Lynch also suggests that teachers conduct introductory activities to determine the range of understandings concerning a concept. Such activities provide insight for teachers concerning common misperceptions about science and help students understand that intuitive knowledge may not always be relied upon in science.

An effective approach for teaching learning strategies is through modeling each strategy in an appropriate context. Teachers serve as intellectual models for their students and, through "think aloud" techniques, coach their students in appropriate problem solving methods (Chamot, 1993). Dr. Lynch refers to this approach as "scaffolding the reasoning process." An example of scaffolding might occur in a lab situation after students have collected data with a lot of numbers. The teacher might take a sample of data and say, "Well, I can see that as this is decreasing, I see this is increasing. What might that mean?" She is using a think-aloud process to guide the students from data, to wondering, to hypothesizing.

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Science Instruction: What Works for Language Minority Students

> By exploring a smaller number of science concepts in different ways, language minority students have the opportunity to learn important content in-depth and acquire necessary language skills.

Modeling is also involved in the following approach to teaching science to second language learners. Adhering to the call for depth over breadth in science curriculum, this approach explores each science concept in different ways. A particular concept is examined through three types of activities: a teacher demonstration, a group investigation, and an independent investigation. Through this three-tiered approach, students progress from a carefully guided presentation to an organized group inquiry to open-ended individual study. This sequencing allows students to progress naturally through stages of language learning: observing to solving, listening to speaking, and interacting to initiating (Fathman, et.al., 1992).

Teacher Demonstration

Though initial activities are teacher directed, the focus in all three levels is on inquiry. During the demonstration phase the teacher guides students into questioning and discovering concepts. Teachers encourage critical thinking and problem solving strategies, and activities are open-ended to stimulate student initiative and different approaches to problem solving. The demonstration phase also involves determining students' prior knowledge on a given topic through methods such as those previously mentioned. Teacher demonstrations are used to introduce a concept, stimulate interest in a topic for individual investigation, show students how to do something, and raise questions or present problems to solve. Demonstrations, if used effectively, give language minority students the opportunity to listen and observe before having to produce any language. Thus, the teacher should take advantage of this opportunity ensuring that language is comprehensible through the use of visuals, gestures, models, drawings, graphs, and charts (Fathman, et.al., 1992).

Group Investigation

Following the teacher demonstration, the group investigation phase allows students to use new language through interaction with other students and offers the opportunity for further exploration of science concepts. Cooperative learning approaches work well at this stage (Fathman, et.al., 1992). Heterogeneous grouping of students provides opportunities for and encourages interaction between second language learners and native speakers. This opportunity for interaction was found to be one of the attributes of effective classrooms for language minority students. By interacting with native speakers in academic contexts, second language learners have access to language unavailable in traditional teacher-directed settings (August and Pease-Alvarez, 1996). Roles taken within these heterogeneous groups are varied according to each student's proficiency level. Fathman, et.al. (1992) provides the following example: "A student who is able to read and write English can record the results of an investigation while a student who writes little English might record numbers on a chart or draw pictures illustrating the group's findings."

Independent Investigation

After the group activity, independent investigation is used to allow each student to explore a science concept alone. At this point, inquiries can be extended outside the classroom. Teachers should remember that students at all levels of English proficiency can conduct individual investigations, but they will vary in their ability to communicate their findings in English (Fathman, et.al., 1992). Students can share their experiences through formats such as "science talk" used at Graham and Parks School, a predominantly Haitian-Creole middle school. In science talk, all students gather in a circle to discuss some area related to findings in their investigations. Students guide discussion, develop topics, argue evidence, explore their results and determine further questions. The teacher facilitates the discussion but relevant topics are introduced and pursued by students (Minicucci, 1996). Though at Graham and Parks, science talk is used in bilingual classrooms with most of the discussion in Haitian-Creole, this approach could be adapted to mainstream science settings as long as teachers ensure the participation of their language minority students.

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Mathematics

Vignette 3: Building Bridges in Mathematics

In a seventh grade classroom in Salinas, California, Latino students are huddled over a model of a bridge that they have constructed. They are trying to determine the proportions needed to build a slightly different bridge three-and-a-half times larger.... By focusing instruction on such themes as architecture (bridges), astronomy (space), and statistics (baseball), mathematics is taught in highly contextualized situations where the focus is on the acquisition of conceptual knowledge, problem solving, and the application of mathematical skills to concrete problems (McLaughlin and McLeod, 1996).

Vignette 4: Spatial Mathematics

Ms. Simis' eighth grade math class includes 15 LEP students. They speak a number of primary languages and have varying degrees of oral English proficiency, but have sufficient English reading and writing skills to participate in an all-English environment. Ms. Simis conducts the class in English.... The next lesson is about spatial math. At the start of the lesson, the teacher tells the students that she once found this aspect of mathematics to be difficult. With patience and persistence, she says, the students will understand it just as she did. Ms. Simis asks students to design three-dimensional buildings using Legos, following a number of specific constraints: "Preserve the right and front view but extend the building." As she introduces the lesson, she asks a student to restate her constraints and instructions; after the second attempt he does so. She then suggests that student "experts" in each group assist other students. The "experts" are not necessarily the most accomplished; Ms. Simis selects students who have struggled to learn something, so they can help others who are struggling.

The students use Lego blocks to model the building, and then draw the structure from all angles on special paper. As they extend the buildings in new ways, Ms. Simis calls these innovations to the attention of the class. When one group says, "We're finished," she challenges, "Now solve it another way" (Berman, et.al., 1995).

Mathematics Standards and the Language Minority Student

These classroom vignettes demonstrate how problem solving in real life contexts is used to teach mathematics to language minority students. Current mathematics reform efforts emphasize that students learn best in settings that challenge and motivate them to fill in mathematical gaps in their knowledge. Thus, teachers are called upon to act as facilitators and provide intellectually challenging problems that encourage students to develop mathematically. Research supports the notion that students will develop their mathematical abilities to a higher degree when motivated by real-life problems (McLaughlin and McLeod, 1996).

> Teaching mathematics to language minority students requires instructional settings and situations where students are engaged in solving interesting real-life problems that encurage both critical thinking and basic skills development and practice.

In order for reform to occur, teachers need to accept that traditional text-book based instruction is no longer acceptable. At Andrew Jackson Middle School, reformers found that math teachers tended to lecture and then assign seat work for practice, which if not finished in class was taken home. The next day, homework was corrected, the next skill introduced and explained, then again student practice was followed by homework. Very little interaction among students occurred, and unless questions were asked, interaction between teacher and students was minimal (Smith, et.al., 1993). Reyhner and Davison (1993) point out that typical mathematics learning materials assume that all students learn mathematics in a verbal abstract manner. However, research on American Indian students indicates that many of these students prefer visual and tactile modes of learning. They suggest the use of a multisensory, activity-centered approach in mathematics. These findings indicate that both what is taught in mathematics and how it is taught need to change.

In 1989 the National Council of Teachers of Mathematics (NCTM) released *Curriculum and Evaluation Standards for School Mathematics*. This landmark document served as a catalyst for mathematics reform. This and other reform documents criticized both the mathematics curriculum as well as the way in which mathematics was taught. As with the previously discussed content areas of social studies and science, the traditional emphasis upon acquisition of facts and technical skills as opposed to the ability to pose and solve problems and engage in independent learning was found to be inadequate in preparing students to be mathematically literate in a rapidly changing, highly technological world. According to the report, problem solving should be central to mathematics curriculum and instruction:

Traditional teaching emphases on practice in manipulating expressions and practicing algorithms as a precursor to solving problems ignore the fact that knowledge often emerges from the problems. This suggests that instead of the expectation that skill in computation should precede word problems, experience with problems helps develop the ability to compute. Thus, present strategies for teaching may need to be reversed; knowledge often should emerge from experience with problems.... Furthermore, students need to experience genuine problems regularly. A genuine problem is a situation in which, for the individual or group concerned, one or more appropriate solutions have yet to be developed (National Council of Teachers of Mathematics, 1989).

Emphasize Problem Solving and Communication

> For language minority students, overemphasizing the learning of basis skills can inhibit students in developing problem solving, reasoning, and other higher-order thinking skills.

This shift in focus on the part of the mathematics community parallels thinking about how to best educate language minority students. Padron and Waxman (1993) note that the traditional notion of educating disadvantaged students in basic skills before exposing them to more challenging academic material has led to what he terms "learned helplessness." For language minority students, a basic skills mastery approach, such as occurs when students are required to learn basic language skills before being introduced to challenging content, can result in limited cognitive mastery, or the lack of ability in problem solving, reasoning, and other higher-order thinking skills. By teaching language minority students critical thinking and problem solving strategies in the context of real problems, the academic achievement of these students will most likely improve. Thus, teaching mathematics to language minority students requires instructional settings and situations, such as those described in the above vignettes, where students are engaged in solving interesting, real-life problems that encourage both critical thinking and basic skills development and practice.

Relate Mathematics to Students' Real-life Experiences

In working with language minority students, teachers must understand that though these students have had many experiences outside of school, these experiences do not necessarily prepare them for the academic work required of them in the classroom. Math teachers can best facilitate mathematical development in their language minority students by designing activities that relate to students' real life experiences. For example, math problems that evolve from after-school job situations allow students to connect what happens in the classroom with their outside world (Buchanan and Helman, 1993). McPartland and Braddock (1993) place relevance of school work high on their list of factors contributing to the school success of disadvantaged students, including those who speak minority languages. Disadvantaged students need to believe that school work makes sense for their current and long-term welfare. They recommend that classroom tasks be intrinsically interesting or directly relate to their current interests and identity

Encourage Mathematical Communication

The NCTM standards also emphasize communication and discourse within the context of mathematical problem solving. The standards explicitly recommend that teachers pose questions and design tasks that engage students' thinking and ask students to clarify and justify ideas orally and in writing (National Council of Teachers of Mathematics, 1989). By integrating math and language teaching, mathematics courses can provide the necessary experiences for language minority students to acquire higher order mathematical competencies and improve their communicative abilities in English. For such learning to occur, students need ample opportunities to hear math language and to speak and write mathematically (Buchanan and Helman, 1993).

Put Students' Needs and Interests First

> If rich real-world problem settings are to be the basis for the mathematics curriculum, then when designing curricula for language minority students, attention needs to be given to the social and cultural contexts underlying the problem settings (Secada, 1992).

Buchanan and Helman (1993) provide guidelines for teaching mathematics and language to language minority students based on NCTM guidelines for designing an environment in which all students will develop mathematical literacy. First of all, teachers must consider the interests and intellectual abilities of their students. Though students may need to work on primary level math concepts, the problems used should relate to their current interests. For example, secondary-level students learning to calculate percentages can use pay stubs from their after-school jobs to determine the percentages of their various withholding categories.

However, Secada (1992) cautions that if rich real-world problem settings are to be the basis for the mathematics curriculum, then attention needs to be given to the social and cultural contexts underlying the problem settings. For example, an intermediate algebra class learning about percentages studied how decreasing rates for electricity are linked to increased consumption, and that increased consumption most often entailed using appliances only the wealthy could afford (air conditioners, pool filtration systems, etc.). Secada points out that this analysis of consumption implies a certain social class background. Such an analysis may, though rich in real-life problem solving potential, serve to alienate language minority students from the curriculum since the experiences may highlight class distinctions already very apparent to many of these students.

Orchestrate Classroom Discourse

> Command of mathematical language plays an important role in the development of mathematical ability.

A second NCTM guideline offered by Buchanan and Helman (1993) directs teachers to orchestrate classroom discourse in a manner that encourages mathematical learning. With language minority students, teachers must attend not only to their cognitive development but also to the linguistic demands of mathematical language. The importance of language in mathematics instruction is often overlooked in the mistaken belief that mathematics is somehow independent of language proficiency. However, particularly with the increased emphasis placed on problem solving, command of mathematical language plays an important role in the development of mathematical ability. Mathematics vocabulary, special syntactic structures, inferring mathematical meaning, and discourse patterns typical of written text all contribute to the difficulties many language minority students have when learning mathematics in English (Corasaniti Dale and Cuevas, 1992).

Teach the Language of Mathematics

Teachers must consider a number of factors concerning vocabulary when developing students' linguistic ability in mathematics. First of all, mathematics vocabulary includes both words specific to mathematics,

such as *equation*, *algebraic*, etc., as well as everyday vocabulary that has different meanings when used in mathematical contexts. Examples include words such as *positive*, *negative*, *table*, and *irrational*. Mathematics also uses strings of words to create complex phrases with specific meanings, such as *a measure of central tendency* and *square root*. Furthermore, students must master the many ways in which one mathematics operation can be signaled. Addition is a prime example with at least six different words or phrases used to indicate it: *add, plus, combine, sum,* and *increased by*. However, simply memorizing these and other signal words will not suffice since the meaning of any given word is determined by the context. Students must also learn to associate mathematical symbols with concepts and the language used to express those concepts. Teachers must be aware that some symbols serve different functions in different cultures. The comma, for example, is used to separate hundreds from thousands, and thousands from ten thousands, and so forth in other countries; whereas in the United States, the decimal point is used (Corasaniti Dale and Cuevas, 1992).

Mathematical syntax involves many precise and difficult structures that are often used in a highly abstract context. Mathematical descriptions frequently use the passive voice, a complex and difficult structure for many non-English speakers. For example: *ten (is) divided by two* and *when 15 is added to a number, the result is 21; find the number.* One of the major difficulties of the syntax used in mathematics is the lack of one-to-one correspondence between mathematical symbols and the words they represent. For example, if translated word for word, the algebraic expression *the number a is five less than the number b* might be recorded as $a = 5 - b$ rather than the correct translation, $a = b - 5$. Researchers have found that non-native speakers tend to follow the surface syntax of problem statements; thus, teachers need to provide students instruction in how to correctly translate linguistic statements into mathematical statements (Corasaniti Dale and Cuevas, 1992).

> Those who teach mathematics to language minority students must have an understanding of the language students will need in order to comprehend and apply mathematical concepts and must be prepared to actively teach that language.

Inferring meaning from mathematical texts is frequently dependent upon knowledge of how key words relate to other words in a problem. Corasaniti Dale and Cuevas (1992) offer this example of a densely packed statement requiring facility with word reference: *Five times a number is two more than ten times the number.* Here students must understand that *a number* and *the number* refer to the same quantity. In addition to intricate semantic features such as word reference, written mathematics discourse has proved troublesome due to a number of features including lack of redundancy or paraphrase (a feature common in oral discourse and even in other types of written material), the use of symbolic devices, technical language with precise meanings, and the large quantity of concepts presented within a small amount of text (Corasaniti Dale and Cuevas, 1992).

Working with written text requires a number of abilities on the part of language minority students. Students must recognize familiar concepts and applications and determine when to apply them. They must also be able to determine when everyday background experience is helpful and when it may interfere with understanding new concepts. Moreover, the ability to think mathematically when reading mathematics text is critical. Mathematics teachers who work with language minority students should employ a dual approach, incorporating instruction on the mathematical language related to the particular concepts being taught along with the concepts themselves (Corasaniti and Dale, 1992).

Create Classroom Environments Rich in Language and Content

Orchestrating classroom discourse with language minority students requires more than a knowledge of the intricacies of mathematical language, it demands that teachers create classroom environments and instructional situations that support and promote the language and conceptual development of students. Teachers and/or students can create charts of commonly used mathematical terminology and display them around the room. In working from concrete problem solving situations to more abstract context-reduced ones, students can begin manipulating mathematical language by writing their own word problems drawn from their mathematical experiences and sharing them with other students.

Encourage Exploration and Reflection through Journal Writing

One useful tool encouraged by the NCTM *Curriculum and Evaluation Standards* is journal writing. Through journal writing teachers can encourage students to explore and write about various strategies for solving mathematical problem. Writing is more than a means of expression; it is also a means of knowing what we think, a way of shaping and refining our ideas. Journal writing in mathematics classrooms allows students who may be too shy or intimidated to communicate their ideas and questions to write freely without concern for grammar or style. In their journal, students can summarize, organize and relate ideas, clarify concepts, and review topics. They can describe strategies, their reactions and accomplishments or frustrations and express positive or negative emotions (Bagley and Gallenberger, 1992).

Bagley and Gallenberger (1992) offer a number of suggestions for journal writing in mathematics classes. Though not specifically intended for language minority students, many of their suggestions would be productive with these students. In some instances, native language use could be encouraged; in others, students should be encouraged to write in English in order to practice working with mathematical vocabulary and linguistic structures, such as those specified above.

Examples of Prompts for Mathematical Journal Writing

(1) Display a picture. Construct a word problem about the picture that can be solved mathematically. Share your problem with a partner and solve it;

(2) What is the most important idea you've learned in algebra this week and why?

(3) Write a paragraph containing as many of these words as possible: ; and

(4) List some things you must remember when answering this type of question or doing this type of problem.

Integrate Reading into Mathematics Instruction

Siegel and Borasi (1992) encourage the integration of reading into mathematics education. Their perspective, though not explicitly stated as such, reflects the influence of the whole language philosophy. Again, though not specifically designed for language minority students, their recommendations for integrating reading and writing into mathematics instruction incorporate practices found to be effective with second language learners.

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Integrating Reading into a Unit on Probability

1. Students are given a written survey in which they are asked to make guesses about the probability of certain events. Through discussion, the teacher elicits students' understandings of probability and encourages questions to guide them in further exploration of the topic.

2. Students then examine the historical events that led to the invention of probability by forming pairs to read selections on probability. In pairs, students take turns reading and then stopping to pose questions and discuss the ideas presented. This "say something" strategy promotes social interaction between students which supports their efforts to work out a meaning for the text. It also encourages them to take ownership for their reading/learning experiences and promotes an inquiry orientation to learning (Siegel and Borasi, 1992). Moreover, such a format works well for language minority students who may have difficulty reading textual materials on their own. By working with a partner, they are given extra support for developing both reading skills and their knowledge base on probability.

3. In follow-up exercises, the teacher asks students to put the historical information in their own words, make connections to the present, or discuss what piqued their interest while reading. By focusing on gaming in history, students can begin discussing various games in which probability plays an important role (Siegel and Borasi, 1992). Language minority students who may have experience with different games can share these with the class at this point.

4. As the teacher begins introducing the technical aspects of probability, students review newspapers and magazines for everyday uses of probability and record these instances on note cards which can then form the basis for a discussion on how probability is interpreted in everyday usage (Siegel and Borasi, 1992).

Through integrating reading, writing and discussion with mathematics content, teachers encourage both greater depth in students' understanding of topics such as probability and the development of academic language skills.

Make Connections to Students' Prior Knowledge and Experience

> Secondary language minority students may have difficulty learning mathematics through traditional text-book driven approaches. Thus, teachers will need to provide learning situations that relate mathematical concepts to students' cultures and life experiences.

A third NCTM guideline recommends that teachers seek and help students seek connections to previous and developing knowledge. This guideline involves both becoming aware of and utilizing students' cultural and educational background knowledge in helping them learn mathematics and connecting the math content to other fields, such as science, language arts and history (Buchanan and Helman, 1993). The above lesson on probability provides an excellent example of how various content areas can be interwoven around a central topic and how students' experiences with games from their own cultures can be integrated

into instruction.

An effective approach for teaching mathematics to language minority students supports the above NCTM guideline by encouraging teachers to make instructional decisions based on students' developing knowledge and thinking about mathematics. Known as Cognitively Guided Instruction (CGI), this approach operates from the following premises:

(1) teachers must know how their students mentally organize mathematical content;

(2) instruction should focus on problem solving;

(3) teachers should determine what their students are thinking about the mathematical content studied;

(4) teachers should design instruction based on their students' thinking (Secada, 1992).

Vary Instructional Methods

A final caveat from NCTM advises that teachers provide opportunities for individual, small-group, and whole-class work (Buchanan and Helman, 1993). The study on attributes of effective instruction for language minority students emphasizes the importance of using a variety of instructional methods, such as direct instruction, guided discovery, cooperative learning, and computer-assisted instruction, tailored to students' needs. When choosing instructional methods, teachers must consider several factors including lesson goals and objectives, learner characteristics, and available resources. Furthermore, in mainstream English-medium classrooms, the level(s) of English language proficiency must also be considered when deciding upon an instructional approach. Through the use of multiple approaches, teachers can meet the needs of a wider variety of students (August and Pease-Alvarez, 1996).

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Language Arts

English Language Arts Standards and the Language Minority Student

The recently released *Standards for the English Language Arts* are among the few national content standards documents that explicitly focus on the needs of language minority students. Two of the twelve standards directly relate to language minority student issues with one focusing on the importance of native language development, and the other promoting an understanding of and respect for diversity in language use. The authors also specifically address issues related to the educational needs of language minority students at various points throughout the document and use several vignettes involving language minority students in mainstream English language arts classrooms to illustrate effective instructional settings for these students (International Reading Association and National Council of Teachers of English, 1996).

> "If we deny second language learners the opportunity to read literature that is for them a mirror, we're doing them a disservice" (Dr. Linda Mauro).

In explaining the standard on developing an understanding of and respect for diversity in language use..., the authors make several important points concerning effective schooling for language minority students.

They state that "the capacity to hear and respect different perspectives and to communicate with people whose lives and cultures are different from our own is a vital element of American society....Celebrating our shared beliefs and traditions is not enough; we also need to honor that which is distinctive in the many groups that make up our nation" (International Reading Association and National Council of Teachers of English, 1996).

Dr. Linda Mauro, English education professor at George Washington University, reinforces these statements in her discussion of the role minority literature can play in the lives of both native and non-native speakers. "I believe that adolescent literature needs to be a mirror of who they are and what they're struggling with as well as a window for understanding the world. So I think for a second language learner if we deny them the opportunity to ever read literature that is for them a mirror, we're doing them a disservice. And if we deny native speakers and native born students a chance to use literature as a window to understand other cultures and other students, we're denying them a chance to look beyond what they already know."

Select Appropriate Texts

> Literature containing themes relevant to the life experiences and cultures of language minority students are more appropriate initial choices than texts having little or no relation to these students' lives.

This standard and the comments by Dr. Mauro relate directly to one of the key issues in English language arts curriculum development, selection of appropriate texts. Teachers working in heterogeneous classrooms containing language minority students should carefully review the literature curriculum. Such a review involves analyzing literary texts for possible barriers to understanding for language minority students. These students may have difficulty with texts that are culturally unfamiliar to them, contain difficult vocabulary and complex themes, and academic or archaic syntax. Research into reading indicates that students use past experiences and background knowledge to make sense out of unfamiliar texts; thus literature teachers need to understand their language minority students' experiences and background in relation to the texts they select for study. Literature containing themes relevant to the life experiences and cultures of these students are more appropriate initial choices than texts having little or no relation to these students' lives.

Literature teachers can facilitate the cognitive and language development of these students if instruction is planned so that more familiar works, such as folktales and myths from students' cultures, are introduced before less familiar texts. Also short stories written by minority authors, such as William Saroyan and Sandra Cisneros, and excerpts from authors such as Amy Tan and Maxine Hong Kingston tend to contain themes and characters with which students from the respective cultures of these authors will be familiar. These works also allow students from the majority culture the opportunity to learn from perspectives that may differ from their own (Sasser, 1992).

The following middle school vignette from the *Standards for the English Language Arts* demonstrates how language minority students and their families are integrated into the language arts classroom through the use of culturally familiar materials and through instructional methods that facilitate parental involvement and language and cognitive development.

Vignette 5: Using Folktales in Language Arts

Middle school students who are originally from a dozen different countries are studying folktales using resources in English and, when available, in their primary languages. Many sources come from their classroom, school, and public libraries, but some, especially those written in the students' primary languages, come from their homes. The students keep reflective reading journals and share responses to folktales they have read in small groups. As a class, the students read selected folktales together and watch videotaped dramatizations of several stories made by previous classes. Watching these tapes excites the students as they see stories from many different cultures being brought to life by their peers. Their teacher models different storytelling techniques, including puppetry, readers' theater, and role-playing.

After a week of reading a number of different stories, the students each select one special story to present to the class. Each student chooses the mode of storytelling that is best suited to his or her story, including staging a story as a mini-drama, drawing a picture, or creating puppets to represent key characters. Students then practice in small groups, and finally they present their folktales to the class. The teacher videotapes each presentation so that students can watch and critique their own presentations later. The videotape will also provide a model for students in next year's class.

As a further exploration of narrative, students ask their parents or caregivers to tell them stories from their own cultures. Working together, students and their parents write out these stories. In many cases, students write the stories both in their first language and in English.... The students work in groups to assemble all of these stories and create a book using the class computer. This book is duplicated so that each student has a copy. A copy is also donated to the school library so that other students may enjoy the stories and see different styles of writing from around the world (International Reading Association and National Council of Teachers of English, 1996).

Make Literature More Comprehensible

To make literature more comprehensible use graphic organizers, have students keep journals, and provide opportunities for students to interact with their peers both orally and in writing.

The language arts standards also emphasize that students read a wide range of literature and apply a wide range of strategies to comprehend, interpret, evaluate and appreciate texts (International Reading Association and National Council of Teachers of English, 1996). In order to help language minority students meet such standards, teachers must adopt instructional approaches which help make literary material more comprehensible to these students and actively teach strategies that will aid them in their endeavors to unlock meaning in works of literature.

Sasser (1992) provides a number of tools teachers can use to engage students in these works. She recommends that graphic organizers, such as clusters, semantic maps, storyboards, matrices, semantic webs, and Venn diagrams, be used to help students visualize and organize thematic content and characters and to keep abreast of plot developments. Through the process of locating and writing down information for various types of graphic organizers, students become involved in responding critically to the work.

Students must sort, categorize, list, analyze, and evaluate both the content of the text and their own reactions to it. Moreover, graphic organizers force students to reformulate information from the text that may be highly abstract in a concrete from. Such activities aid students in comprehending and expressing difficult ideas. Students should also keep journal entries and interact with their peers both orally and in writing about literature. Together, all these activities give language minority students the extra support needed for successful academic experiences with literature.

Implement a Whole Language Approach

> Language arts teachers can work collaboratively with ESL/bilingual teachers to design literature units and lessons that incorporate effective instructional strategies for language minority students.

The whole language philosophy, which views meaning and natural language as the foundations for literacy development, and the teaching/learning techniques associated with it have been found to conform with what is known about effective instruction for language minority students (Kauffman, et.al., 1995). Whole language approaches are particularly well-suited to language arts classrooms where students through reading, writing, speaking and listening are actively involved in constructing meaning from both their own experiences and through encounters with various texts. Kauffman, et.al. (1995) includes a description of a whole-language unit on *To Kill a Mockingbird* that was developed collaboratively by ESL and English literature teachers. The unit was designed for use in coordinated ESL and mainstream literature classes and asks students to consider the themes of love and conflict, the individual and society, blindness and sight, and passages and transformations. The unit is presented in three stages called INTO, THROUGH, and BEYOND.

Sasser (1992) describes the INTO stage as what occurs before reading begins. The purpose here, particularly for language minority students, is to interest the students in the text and elicit prior knowledge that may be useful in interpreting the work. Anticipation guides, often composed of simple true-false or agree-disagree statements, encourage students to identify and think through their positions on ideas prevalent in the literary work. The teacher can also introduce the reading by providing a summary of the plot in order to preview the plot and characters. During this stage, the teacher can also elicit predictions from the students about the content and outcome of the work. By having students write down their predictions prior to and through out the course of the reading, students can track their understanding and increased sophistication of their predictions and ideas.

During the THROUGH phase, students read the text. Silent reading can be enhanced by the teacher reading selected portions of the work aloud. In this manner, language minority students can get a better sense of inflection, pronunciation, rhythm and stress which can aid in understanding. To aid language minority students in developing the skills necessary for comprehension of a complex work of literature--skills such as following a sequence of events, identifying foreshadowing and flashback, visualizing setting, analyzing character and motive, comprehending mood and theme, and recognizing irony and symbols--teachers might choose excerpts for discussion, helping students sort out what is significant from what is less so. Interchanges, either oral or written, allow students to share their ideas with one another and the teacher; in the process, students who may come from educational systems that stress only one right answer, begin to realize the possibility for multiple interpretations. In addition, during the THROUGH phase, the use of graphic organizers, as previously mentioned, becomes important as students grapple with the complexities of theme, character, and plot. Teachers can integrate writing by having students keep reading

logs, assume the identities of characters to write letters, make up dialogue for characters, and rewrite scenes from different perspectives.

The BEYOND stage involves students in activities that extend beyond the text. At this point students write and discuss in order to refine their thoughts and deepen comprehension. Comparing a book with its film version or creating a drama from a scene in the work are appropriate at this point. Conducting further research on issues raised within a work or responding to a work through poetry writing are other examples of how teachers can further student involvement with a literary work. The description of the mainstream classroom's INTO, THROUGH, and BEYOND activities on the *To Kill A Mockingbird* unit follow:

Vignette 6: *To Kill a Mockingbird*

In the first stage, students read and discuss poems about truth and short stories such as "A Death in the House" by C. Simak. Following the discussion, students participate in a simulation exercise dealing with segregation. Students are divided into pairs with one member considered a first-class citizen (white) and the other a second-class citizen (Black). Pairs work together to find and write definitions for assigned words, identify suffixes, locate sentences in the text in which the words are used, and present the information to the class for discussion. Only the first-class citizen of the pair may present information, receive credit and be rewarded for their efforts. The second-class citizen, on the other hand, is expected to assist in completing the vocabulary activity and perform tasks involving physical labor (getting and returning the dictionary). At no point are any second-class citizens' efforts recognized or rewarded. At the conclusion, students discuss how they felt during the simulation and use the phrases, "I noticed," or "I learned." This activity is followed by viewing and discussing the film, "Amazing Grace."

In THROUGH, students complete daily writing activities, study questions and vocabulary development activities to better understand the novel. In one activity, students read a chapter or scene and choose a quote to represent it. Next, they illustrate the quote to depict its significance. Later students share their illustrations with the class and consider new perspectives for interpreting the chapters or scenes....

In BEYOND, students listen to and discuss the song "The Way It Is" by Bruce Hornsby. Next, they brainstorm criteria for a good novel and evaluate the book based on these criteria. At the end of the unit, they take an objective test (Kauffman, et.al., 1995).

Encourage Students to Maintain the Native Language

Authors of the English language arts standards stress the importance of native language development in learning English. This standard directly states that language minority students should make use of their first language both for learning English and content-area subject matter. A recent study found that among the major instructional features impacting the academic success of language minority students in predominantly English-medium settings was the opportunity for native language use. For monolingual English teachers or those teachers who do not speak all the languages of their students, the study outlines several ways in which teachers can facilitate native language use. These include structuring instructional activities that require students to use their native language; utilizing the services of aides or tutors fluent in the native languages of the students to assist in explaining content materials; and allowing students to respond in their native language to questions asked in English (Tikunoff, et.al., 1991). In addition, locating native language resources, such as books, magazines, films, etc. relating to the topic or theme supports

native language development when other resources may not be available. Lucas and Katz (1994) describe how students not yet proficient enough in English can write in journals or keep reading logs in their native languages. Teachers can also utilize their students' linguistic resources by pairing students with the same native language but different levels of English proficiency so that more proficient students can tutor less proficient students. The following is an example of this type of peer tutoring arrangement used to facilitate student writing:

Vignette 7: Native Language Peer Tutoring

The teacher sets out the steps for the day's lesson on the process of writing a family history. The class, a heterogeneous grouping of middle school students whose native languages are Spanish, Vietnamese, and Korean, watch quietly and attentively as Norma (the teacher) brainstorms the topic, scribbling notes about her family history on the overhead projector as a model of how this prewriting technique can help them begin exploration of this topic. Next, Norma turns to the chalkboard, writing her first draft as she explains the students' task. When she is done, students turn to each other at their tables to exchange ideas for their own family histories. After about 5 minutes, Ana leans over Rosa's paper already three-quarters filled with writing in Spanish and English. Rosa has only been in the program for 1 month.... Norma describes her level of English as low intermediate. Ana, on the other hand, has high-intermediate English skills. Norma has carefully constructed students' groups to make sure each contains students with different skill levels so that students can help each other in either English or their native languages. Her brow furrowed, Rosa consults with Ana, discussing both what is on the sheet and what still needs to be added. She speaks quickly and quietly in Spanish, an occasional word from the sheet in English breaking the flow (Lucas and Katz, 1994).

Provide a Balanced Writing Program

Several of the language arts standards emphasize the importance of writing as a process and as a means of authentic communication with various audiences. Dr. Mauro also stresses the importance of a balanced writing program that promotes fluency, clarity and correctness. "If students can write correctly, but it's not clear and they aren't able to convey their meaning, that does students a disservice. There has been too much of a focus, in the previous generation, on correctness, and too much focus more recently on fluency by teachers who misunderstood the notion of the writing process." Dr. Mauro believes that teachers must actively teach correctness in the context of meaningful and authentic writing assignments. Clarity must also be taught using structured techniques that help students think about ways to organize their writing and that promote their working together to support one another's writing development. She provides the following classroom activity designed to teach persuasive writing that would work well with language minority students as well as native speakers:

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Teaching Persuasive Writing

The class meets to select a topic that most everyone is interested in, a topic such as capital punishment. Students discuss the topic, sharing cultural and religious views, or views in other countries on the death penalty. Students also spend time reading various materials on capital punishment that are appropriate for their reading level. Native language materials could also be used if available. Students must then give two reasons why they might be in support of the death penalty and two reasons why they might be against it. Next they choose sides, identifying which side they have chosen with a name tag. Each student visits two other students who represent their own opinion, then two who are opposed to their opinion. They use a form to record their own responses, the responses of those who agree with them, and the responses of those who disagree. This process involves students in talking through other people's ideas in a respectful way. The next step involves teaching them how to explicitly and clearly structure a persuasive essay. Using their own ideas and those they gathered from others, they are taught how to raise the opponents beliefs through expressions such as, "Though some people may believe...," and expressions that counter the opponents' arguments. This activity teaches clarity in a setting where students are encouraged to talk and share with one another and requires that students build on the ideas of others (Dr. Linda Mauro).

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Assessing Language Minority Students in the Content Areas

Fair and meaningful testing should be an integral component of the mainstream education of language minority students. All too often, though, these students are either asked to participate in tests that make unfair assumptions about their English language proficiency in order to assess their content knowledge or, conversely, are totally excluded from any testing until their English language proficiency has reached a certain level. Furthermore, often due to gaps in their educational experience, language minority students when measured against their native English speaking peers may fail to meet mainstream instructional goals; however, these students often achieve impressive academic gains when compared to where they began (Cornell, 1995).

Characteristics of Sound Assessment for Language Minority Students

When assessing language minority students, teachers need to ask whether they are measuring language proficiency or content knowledge?

Authors of the study on attributes of effective instruction for language minority students list five attributes that should inform assessment for language minority students. A primary concern is that these students be assessed for both content knowledge and language proficiency. Secondly, whenever possible and appropriate, schools should make efforts to assess students' content knowledge and abilities in the native language as well as in English. Native language assessment is particularly important when students have learned certain content concepts and skills in their native language. Without such assessment, teachers are likely to underestimate students' academic achievement. A third characteristic of sound assessment practice entails ensuring that a diversity of measures (e.g., portfolios, observations, anecdotal records, interviews, checklists, criterion-referenced tests etc.) are used to measure content knowledge and skills. A

varied approach to assessment allows the teacher to incorporate information about language minority students in "a variety of contexts obtained from a variety of sources through a variety of procedures." A fourth attribute concerns teacher awareness of the purpose of the assessment. Is the test intended to measure language proficiency or content knowledge? Finally, knowledge of a student's background, such as educational experiences and parents' literacy, should contribute to a more complete assessment picture (August and Pease-Alvarez, 1996).

Though recommendations list essential characteristics of good assessments, researchers do not know how to reliably measure how much children are leaning except through standardized tests, which pose problems when administered to language minority students. Additionally, such tests are unable to measure the different kinds of learning discussed above and advocated for by education reformers. On the other hand, it is also unclear as to whether performance and portfolio assessment will meet the needs of language minority students (McLaughlin and McLeod, 1996). With this caveat in mind, however, these alternative forms of assessment offer the best opportunities for realistic assessment of the actual performance of language minority students on different types of learning tasks.

Alternative Methods of Assessing Language Minority Students

> Portfolios can be useful both for teacher appraisal of student work and for student self-appraisal.

Alternative assessment requires students to perform authentic academic tasks, similar to those originally used to teach the material, rather than merely regurgitate information. Such assessment is also continuous, allowing the teacher to track student growth throughout the school year. Options for alternative assessment include writing samples, group projects, oral history projects, historical and contemporary role playing, job interview role playing, games, science exhibitions, merit badges, student-run banks and stores, designing newspaper ads, and developing a class newspaper. Student responses on alternative assessments may include using checklists, learning logs, book reports, writing samples, explanations of problem situations, science lab reports with diagrams, dialogue journals, self-evaluation of strategy use, and oral descriptions. Portfolios facilitate the organization of student responses to assessment tasks. Periodically, teachers and students discuss which samples of student work should be included in the portfolio, which should also contain teacher rating forms, checklists, observation notes and other information concerning student progress toward meeting instructional objectives (Chamot, 1993).

The Guide to Performance Assessment for Linguistically Diverse Students (Navarrete and Gustkee, 1996) describes a number of specific assessment techniques that can be used for improving performance assessments of language minority students in content area settings. These include:

- Allowing extra time to complete or respond to the assessment tasks;
- Designing administration procedures to match classroom instructional practices (e.g., cooperative small groups, individual conferencing, and assessing in the language of instruction);
- Simplifying directions in English and/or paraphrasing in the students' native language. Also providing additional clarifying information during and/or after administration of the assessment (e.g., synonyms for difficult words or phrases); and
- Permitting students to use dictionaries or word lists.

In addition to these recommendations, local schools and districts, in an attempt to be sensitive to their student's level(s) of language proficiency, have developed performance assessment tasks that consist of the following components:

- Supporting assessment tasks in a contextualized manner by:
  (a) incorporating familiar classroom material as a stimulus, such as brief quotations, charts, graphics, cartoons, and works of art;
  (b) including questions for small group discussion and individual writing; and
  (c) mirroring learning processes with which students are familiar such as the writing process and reading conferencing activities.

- Including teacher observations, student self-appraisals and parent judgements/observations of their child's progress.
- Designing assessment tasks that require different ways of demonstrating knowledge or skill (e.g., exhibits, dramatic renditions, interviews, observations, self reflections, and a variety of writing samples) (Navarrete and Gustkee, 1996).

The George Washington University education professors, Dr. Mauro, Dr. Lynch, and Dr. Steeves, all recommend alternative assessment practices for their respective content areas and express particular support for its use with language minority students. For social studies, Dr. Steeves encourages the use of oral tests with both native and non-native speakers. Such alternative test taking formats give native speakers the opportunity to experience a different style of test taking. At the same time, when given to all students, language minority students are not singled out. Oral storytelling and project-oriented assessment are other alternative methods of assessing second language learners. Projects could include journal writings, reactions to different time periods, etc. Though this type of assessment is worthwhile, it can be time consuming to evaluate. One solution is to have students present their projects through an exhibition format, such as "History Day." While students make public their best work through demonstration and explanation, teachers have the opportunity to evaluate it.

In the language arts, Dr. Mauro recommends the use of portfolios which can be used to look at student improvement over time as well as for grading individual pieces. She also advises that students select three ungraded pieces of their work that are best representative of their growth. Students then write about which pieces they like best and why, and how they think they have developed as a writer. Afterwards, teacher and students meet to discuss their progress.

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Preparing Mainstream Teachers to Work With Language Minority Students

> Most mainstream preservice teachers lack the knowledge, skills and experience essential for working successfully with language minority students.

The above discussion on the education of language minority students within mainstream settings emphasizes the importance of effective instruction, curriculum and assessment for these students. However, such instructional and curricular decision making cannot occur unless mainstream teachers receive the type of preparation and training necessary to work effectively with these students. However as Chisholm (1994) reports, most preservice teachers lack the knowledge, skills, and experience essential for working with minority children, including language minority students. Many of these teachers also express a high degree of insecurity about working with these students. Such insecurity can lead to an aversion

toward teaching in culturally and linguistically diverse schools. A recent survey found that only 9 percent of preservice teachers indicated that they would prefer to teach in urban or multicultural contexts, and fewer than 3 percent were capable of teaching in a language other than English (Chisholm, 1994).

> Teacher education is the key to improving mainstream instruction of language minority students.

Furthermore, most mainstream teachers received their teacher training under the assumption that their students would be native English speakers. This assumption often leads teachers to feel resentful and even fearful of language minority students. These assumptions and feelings are even more prevalent at the secondary level where teachers identify themselves as content specialists not responsible for the additional demands of language instruction (Constantino, 1994). However, research has shown that mainstream teachers who receive appropriate training in how to teach language minority students are able to create instructional environments supportive of second language and content learning (Castaneda, 1993). According to Castaneda (1993) training that promotes cooperative grouping strategies, sheltered ESL approaches, and collaboration between mainstream and bilingual staff were perceived to be most helpful by mainstream teachers involved in her study.

Teacher Education in Practice

Dr. Mauro involves her English language arts preservice teachers in an innovative activity designed to give them insight into the educational needs of many second language learners in mainstream classrooms. She first asks her students to write on an unfamiliar assigned topic. She tells them that she is tired of receiving sloppy, incoherent writing, and that they have 20 minutes to compose a well-written paragraph. Since, she continues, they have not been following the rules of the English language, simple rules they should know by now, she will review them. On the board, she gives them a number of rules, such as making sure that adjectives follow nouns and various (non-English) methods of forming the past tense. She then reiterates that they have 20 minutes to write their paragraphs and that they can begin. As they're writing, she circulates, hovering over each of them.

What the students discover from this exercise is that they're almost incapable of writing with any meaning when (a) they don't understand what they're writing about, and (b) they're trying to write according to rules that are unfamiliar to them. From this exercise, students begin to understand the difficulties language minority students confront when teachers overemphasize correctness in a language students do not yet fully understand.

> The majority of new teachers will be teaching students who come from a variety of cultural and linguistic backgrounds.

Despite the recognition that most secondary teachers are unprepared to work with language minority students, secondary teacher education departments have generally not changed their programs partly due to the expectation that secondary education majors will take a great deal of their coursework outside the education department in their various content fields, where little effort is made to connect content with the teaching and learning of that content. Moreover, very little research has been done to assist teacher educators in preparing secondary teachers to work with language minority students in their classrooms.

Finally, exacerbating the situation is the prevailing attitude that teaching language is the responsibility of the ESL or bilingual teacher and that these students should be ready when entering the mainstream classroom to learn academic content in English (Constantino, 1994).

Incorporate Language Minority Student Issues into Teacher Education Programs

An innovative program initiated in the Chicago Public Schools set out to train bilingual/ESL and mainstream teachers to work collaboratively with one another. Training topics the project emphasized for enhancing the instructional competencies of both mainstream and bilingual/ESL teachers might indicate some of the areas teacher education programs need to address.

Areas Mainstream Teacher Education Programs Need to Address

- **Adapting mainstream lessons and learning materials to meet the needs of language minority students;**
- **Making oral presentations more comprehensible;**
- **Identifying suitable learning materials and matching them to the instructional needs of the students;**
- **Promoting the interaction of language minority and native English speaking students through cooperative learning activities;**
- **Promoting comprehension of academic English by teaching specific learning strategies;**
- **Incorporating ESL methods into the mainstream classroom;**
- **Managing multi-language level classrooms;**
- **Assessing and grading language minority students;**
- **Distinguishing between language difficulties and learning problems; and**
- **Working with teaching assistants (Sakash and Rodriguez-Brown, 1995).**

Teachers as Cultural Translators and Cultural Brokers

Milk, et.al. (1992) refers to several major functions mainstream teachers need to perform in order to take a more active role in the education of language minority students. Mainstream teachers need to act as mediators and facilitators of both content learning and English language acquisition. They need to serve as language models and as mediators of mainstream culture. Chisholm (1994) aptly refers to teachers who perform these functions as cultural translators and cultural brokers. Mainstream teachers must also advocate for their language minority students and collaborate with both administrators and other teachers to provide information about these students and about the content of their classes. Overall, Milk calls for teacher education programs that, though they may differ in their specifics, focus on how language minority students learn, in light of their unique needs as second language learners from non-mainstream cultural backgrounds.

Make Coursework and Field Experiences More Relevant to Today's Diverse Classrooms

Coursework at all levels should integrate methods for teaching language arts to language minority students and provide preservice teachers with a repertoire of methods and skills for adapting instruction

Teacher education programs must rethink who they are preparing teachers to teach. No longer will teachers face classrooms composed mainly of white, middle-class, English speaking students. Chisholm (1994) calls for a multiculturally infused teacher education curriculum which goes beyond the addition of one or two courses addressed to special needs issues, such as those of language minority students. Along with culturally relevant field experiences within diverse communities, she advocates for an infused curriculum in which all aspects of the education program, coursework and field experiences, involve preservice teachers in developing the skills and knowledge necessary for successful practice in diverse classrooms.

Coursework at all levels should integrate methods for teaching language arts to language minority students and provide preservice teachers with a repertoire of methods and skills for adapting instruction. Classes should familiarize education students with ESL teaching methods and strategies and alternative methods of assessing student progress. Knowledge of the contributions of linguistically and culturally diverse peoples to the content areas should be integrated throughout the liberal arts and teacher education components of the program. Coursework should help preservice teachers acquire a sound basis in assessment and incorporate test bias, alternative testing methods, interpretation of test results, and ethnographic and observational techniques. Education programs should prepare their students to recognize cultural bias in tests and to use valid and culturally sensitive assessment measures. Preservice teachers must be able to use technology in a culturally sensitive manner. They must be able to assess software for the accuracy of its cultural content as well as for its educational merit. Finally, coursework should teach education students how to incorporate differences in cognitive and learning style into classroom instruction and make them aware of the cultural underpinnings of many students' learning preferences (Chisholm, 1994).

An integral part of any teacher education program is the quality of its field experiences. Education programs serious about training teachers to work with language minority students must provide them with field experiences that allow them to both observe how effective teachers work with language minority students and to practice teaching in multilingual environments. Productive field experiences also give preservice teachers ample opportunities to reflect with their peers and collaborating teachers on their developing ability to work with these students. Finally, teacher education programs must assess the cultural competency of its prospective teachers. Sound evaluation of cultural competency should involve students in multiple opportunities and a variety of tasks to prove their ability. In addition, more than one culturally sensitive evaluator should be used. Such a multifaceted approach will more likely ensure reliability and fairness (Chisholm, 1994)

Educating our future teachers to work with language minority students is no longer a preference but a necessity. In examining whether preservice programs are up to the task of educating these teachers to work with a diverse population, teacher educators need to question the extent to which their program increases cultural self-awareness, an appreciation of diversity, and cultural competency; and prepares teachers to work effectively with a variety of students and parents.

Conclusion

Secondary-level language minority students placed in mainstream classrooms must no longer be treated as second class citizens whose learning is relegated to bilingual or ESL teachers. Just as new education standards call for the education of all students to high standards, all teachers must be responsible for and capable of educating their language minority students. In order for this to occur, tough new standards and knowledge of effective practices for these students must coincide with classrooms staffed by teachers trained to implement the kind of teaching necessary to assist language minority students attain these standards. Integral to this reform, is a shift not only in how all educators, both within middle and high schools and within college and university education departments, think about these students but in how

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they practice their profession. Contrary to popular opinion, Dr. Mauro argues that in order to change underlying philosophical beliefs, educators must first change their behaviors. In other words, practice influences belief. "Most teachers want to be good teachers. When someone is able to demonstrate an effective method for you that works with your students-- they're excited about coming to class, their writing is good, and you see real development-- you begin to do more of that method, and the more you do, the more you begin to advocate for it, and it becomes your philosophical base. Change in behavior can lead to philosophical change."

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